FortiProxy Troubleshooting

Viswabharath
EMEA Escalation Team

Introduction

FortiProxy Secure Web Gateway

- High Performance and Scalability Proxy
- Dedicated Secure Web Gateway Solution
- Pay As You Grow License
- Multi-Layered Detection to prevent threats
- Authenticated Web Application Control
- Wan Optimization and Advanced Caching

SSL INSPECTION

- Powerful hardware
- Removes blind spots in encrypted traffic
- Multiple inspection methods

MULTI-LAYERED PROTECTION

- Integration with proven FortiGuard Threat Intelligence
- Integration with FortiSandbox

AUTHENTICATED ACCESS

- Granular application control policies
- Activity monitoring
- Restricts access to social websites using user or group identity

FortiProxy Appliance Lineup

Specification	FPX400E	FPX2000E	FPX4000E
Base Features	**Advanced Caching and WAN Optimization**		
User License	500-4000 Users	2,500-25,000 Users	15,000-50,000 Users
Service License (All-Inclusive)	Web Filtering, DNS Filtering, Application Control, DLP, AV, IPS, Botnet (IP/Domain) and FortiSandbox Cloud		
Ports	4 x 10/100/1000 RJ45	2 x 10/100/1000 RJ45 **2 x 10/100/1000 RJ45 bypass** 2 x 1GbE SFP 2 x 10GbE SFP+	4 x 10/100/1000 RJ45 **2 x 10/100/1000 RJ45 bypass** 2 x 1GbE SFP 4 x 10GbE SFP+
Memory	8GB	64GB	128GB
Storage	4TB (2 x 2TB HDD)	8TB (4 x 2TB HDD) (plus 4 x 2TB Optional)	8TB (4 x 2TB HDD) (plus 8 x 2TB Optional)
SSL Hardware	2 x CP9	2 x CP9	2 x CP9
Power Supply	AC power supply (Optional Dual)	Dual AC power supply	Dual AC power supply

All platforms support FIPS 140-2 and Common Criteria

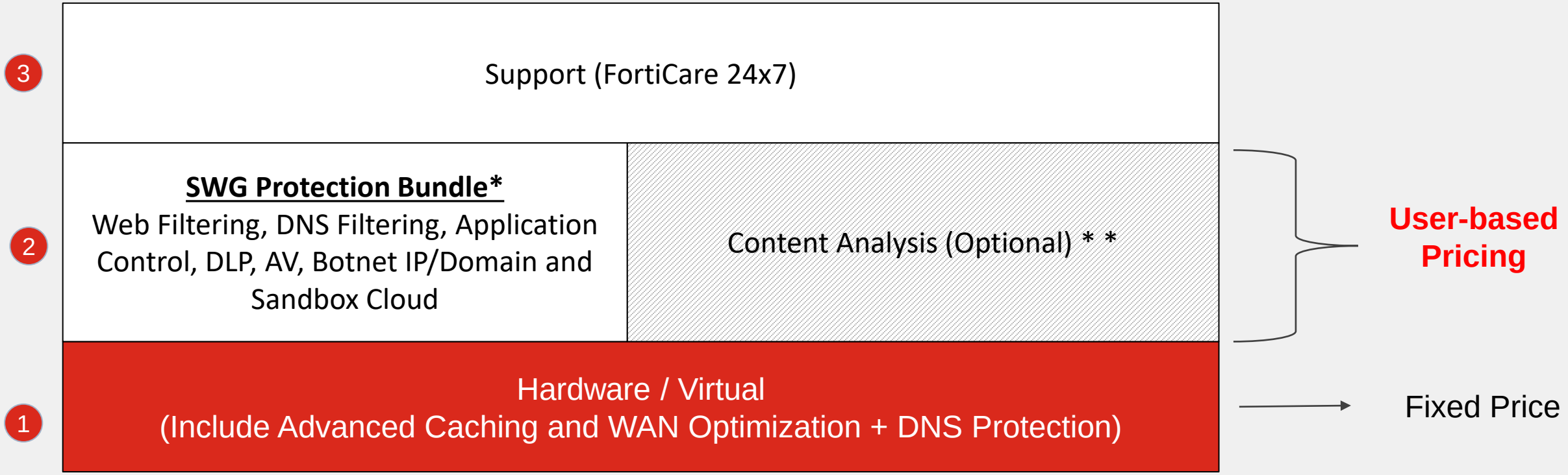
FortiProxy VM Lineup (VM01-VMUL)

Specification	VM01	VM02	VM04	VM08	VM16	VMUL
Base Features	**Advanced Caching and WAN Optimization**					
User License	100 Users	100 - 500 Users	100 -2,500 Users	100 - 10,000 Users	100 -25,000 Users	100 - 50,000 Users
Hypervisor Support	VMware ESX/ESXi, KVM Platform and Microsoft HyperV					
Service License	**SWG Protection Bundle:** Web Filtering, DNS Filtering, Application Control, DLP, Antivirus, IPS, Botnet (IP/Domain) and FortiSandbox Cloud					
CPU	2x vCPU	4x vCPU	8x vCPU	16x vCPU	32x vCPU	Unlimited vCPU
Memory	Unlimited (G) x RAM					
Storage	1 Disk	2 Disks	2 Disks	4 Disks	8 Disks	16 Disks
Ports	Up to 10 Interface					

Licensing

Licensing Model

***PAYG** User Based Licensing – Minimum users required*



* Scale up to 50K users depend on HW/VM Model

** Equal to SWG Protection Bundle amount, Real-time analysis of images to detect adult content. Detection of adult content in images uses various patented techniques (not just color-based), including limb and body part detection, body position, and so on.
When adult content is detected, such content can be optionally blocked or reported.

How FortiProxy calculate the number of users/seats?

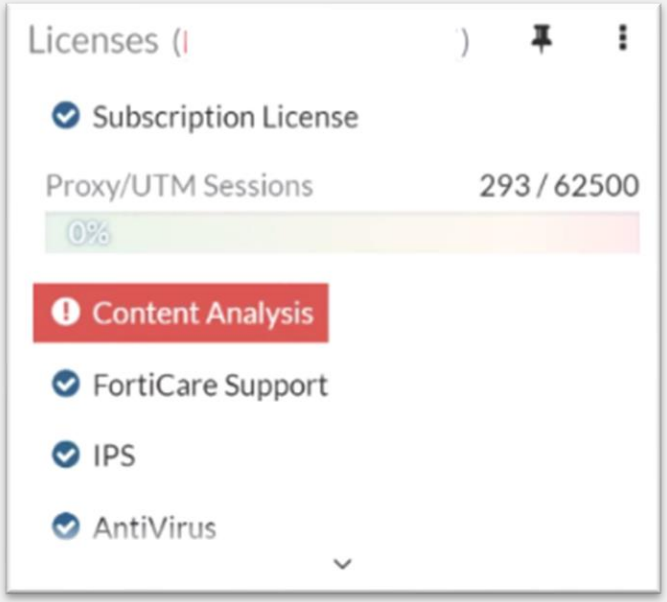
- FortiProxy give 25 sessions per 1 User License.

  i.e. customer purchase 2500 users license, he will be entitled for 62,500 sessions (can be from 1 source IP or from many – up to 62,500 source IPs).

- If the number of users/sessions exceeds the license number, we will block the traffic or bypass security check for the traffic based on the user setting.

```
config system global
set license-overlimit {bypass | block}
```

```
bypass -   Bypass further traffic when licensed user is reached.
block -      Block further traffic when licensed user is reached.
```



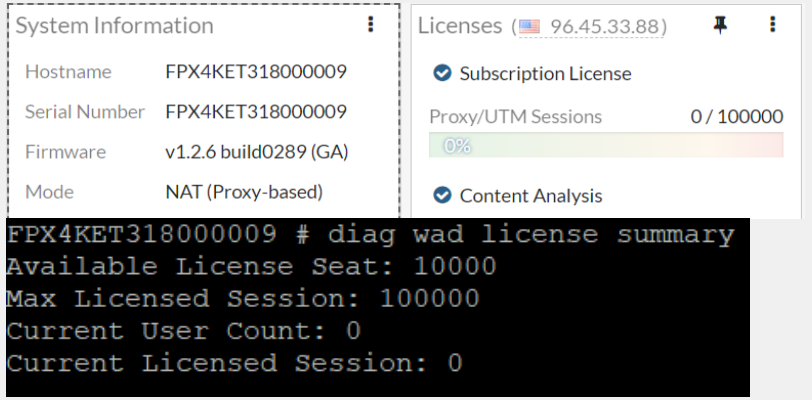

```
# diagnose  wad license summary
Available License Seat: 2500
Max Licensed Session: 62500
Current User Count: 75
Current Licensed Session: 293
```

How FortiProxy calculate the number of users/seats?

License calculation

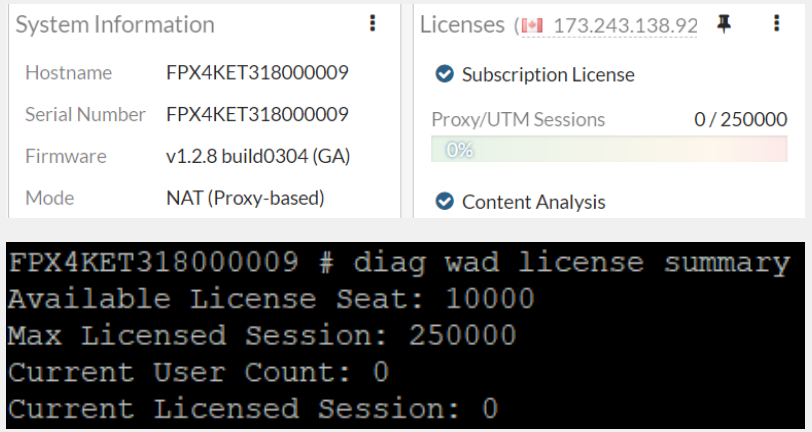
- 1.2.7 & Before

10000*10 = 100000 sessions



- 1.2.8 and later

10000/25 = 250000 sessions



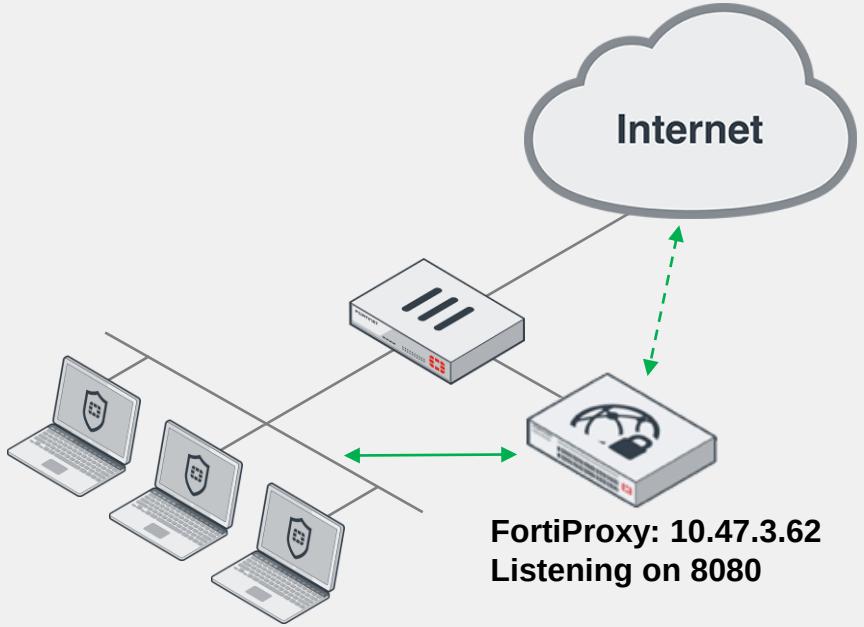
FortiProxy HA - Licensing

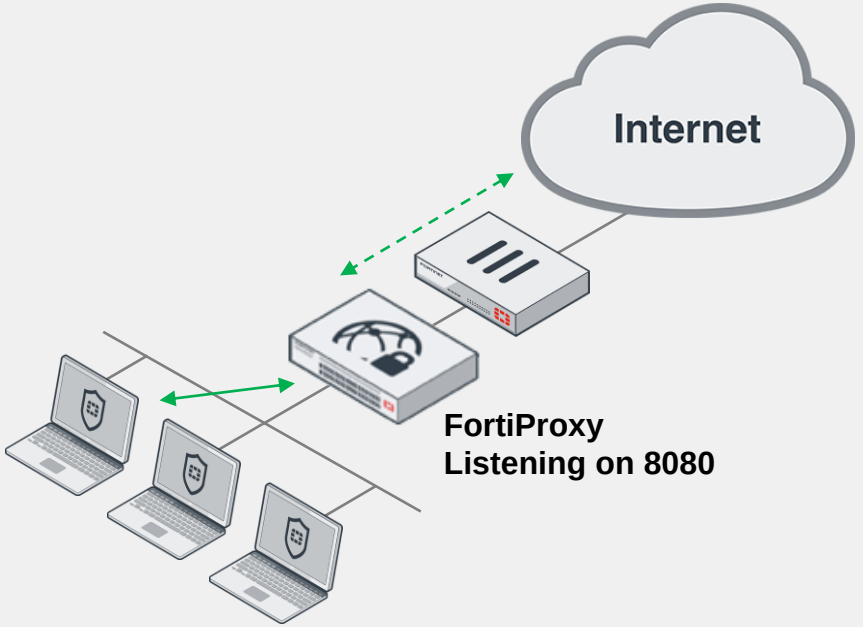
- When Working in HA, License is shared between cluster members.
- 50% of the slave licenses are added to the Primary unit.
- License count = Primary unit seat + 50% of Secondary HA member.

```
FPXVM10000150452 # diag wad license
License Seats Registered:
FPXVM10000150452: 250
FPXVM10000150453: 250

New License Seats Adjusted:
FPXVM10000150452: 375
FPXVM10000150453: 125

Available License Seat: 375
```

Deployment modes

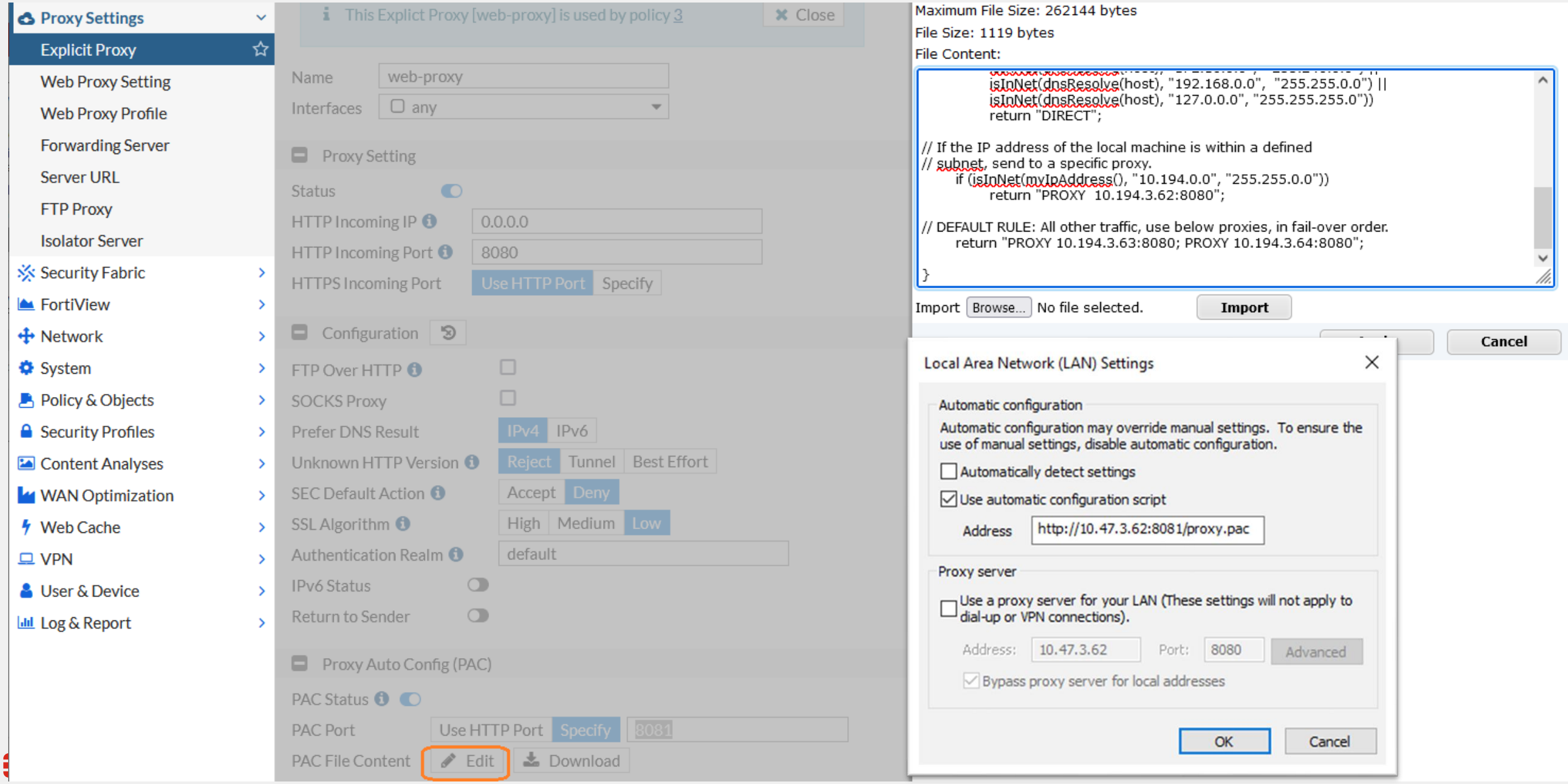
Explicit Proxy Deployment





Browser directs HTTP/S traffic to the FortiProxy Explicit Proxy (PAC file Configuration supported).

Explicit Proxy Deployment: pac file



Explicit Proxy Deployment:download pac file

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	10.194.3.61	10.47.3.62	TCP	66	63053 → 8081 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=25
2	0.000749	10.47.3.62	10.194.3.61	TCP	66	8081 → 63053 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS
3	0.000883	10.194.3.61	10.47.3.62	TCP	54	63053 → 8081 [ACK] Seq=1 Ack=1 Win=2102272 Len=0
4	0.001403	10.194.3.61	10.47.3.62	HTTP	288	GET /proxy.pac HTTP/1.1
5	0.001736	10.47.3.62	10.194.3.61	TCP	60	8081 → 63053 [ACK] Seq=1 Ack=235 Win=30720 Len=0
6	0.001901	10.47.3.62	10.194.3.61	HTTP	1282	HTTP/1.1 200 OK (application/x-ns-proxy-autoconfig)

```
> Frame 6: 1282 bytes on wire (10256 bits), 1282 bytes captured (10256 bits) on interface 0
> Ethernet II, Src: 00:45:72:74:05:02 (00:45:72:74:05:02), Dst: 00:45:72:74:04:01 (00:45:72:74:04:01)
> Internet Protocol Version 4, Src: 10.47.3.62, Dst: 10.194.3.61
> Transmission Control Protocol, Src Port: 8081, Dst Port: 63053, Seq: 1, Ack: 235, Len: 1228
> Hypertext Transfer Protocol
v Line-based text data: application/x-ns-proxy-autoconfig
    function FindProxyForURL(url, host) {\r\n
    \r\n
    // If the hostname matches, send direct.\r\n
    \tif (dnsDomainIs(host, "intranet.domain.com") ||\r\n
    \t\tshExpMatch(host, "(*.abcdomain.com|abcdomain.com"))\r\n
    \t\treturn "DIRECT";\r\n
    \r\n
    // If the protocol or URL matches, send direct.\r\n
    \tif (url.substring(0, 4)=="ftp:" ||\r\n
    \t\tshExpMatch(url, "http://abcdomain.com/folder/*"))\r\n
    \t\treturn "DIRECT";\r\n
    \r\n
```

Explicit Proxy Deployment: Web Traffic

```
# diagnose wad filter src 10.194.3.61

# diagnose wad session list

Session: explicit proxy 10.194.3.61:63176(10.47.3.62:15006)->23.74.131.118:443 id=1189799668
worker=0 vd=0 fw-policy=3
```

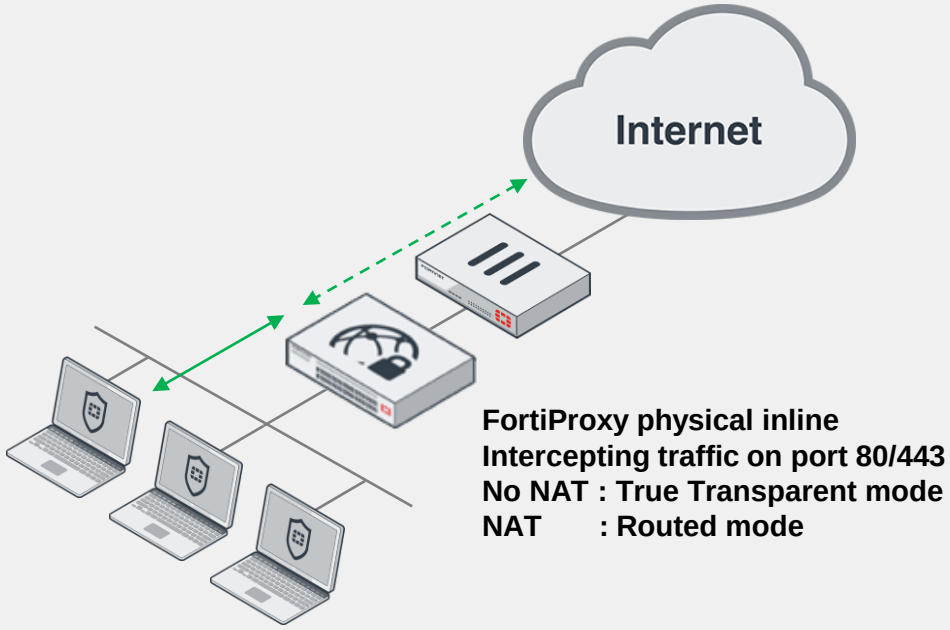
Log & Report	#		Date/Time	Source	Destination	Service	Result	Policy
Forward Traffic	1		11:32:25	10.194.3.61	23.74.131.118	HTTPS	33.20 kB / 12.72 kB	3 (Allow-ExplicitWebProxy)

tcp.port==63176 or tcp.port==15006

	Time	Source	Destination	Frame len	Server Name	Info
373	19.662763	10.194.3.61	10.194.3.62	66		63176 → 8080 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM=1
374	19.662823	10.194.3.62	10.194.3.61	66		8080 → 63176 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1460 SACK_PERM=1 WS=1024
375	19.663294	10.194.3.61	10.194.3.62	54		63176 → 8080 [ACK] Seq=1 Ack=1 Win=2102272 Len=0
378	19.663728	10.194.3.61	10.194.3.62	269		CONNECT www.ti.com:443 HTTP/1.1
379	19.663749	10.194.3.62	10.194.3.61	54		8080 → 63176 [ACK] Seq=1 Ack=216 Win=30720 Len=0
384	19.903917	10.47.3.62	23.74.131.118	74		15006 → 443 [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SACK_PERM=1 TSval=303823 TSecr=0 WS=1024
386	20.100189	23.74.131.…	10.47.3.62	74		443 → 15006 [SYN, ACK] Seq=0 Ack=1 Win=65160 Len=0 MSS=1460 SACK_PERM=1 TSval=4141243177 TSecr=303
387	20.100265	10.47.3.62	23.74.131.118	66		15006 → 443 [ACK] Seq=1 Ack=1 Win=29696 Len=0 TSval=303842 TSecr=4141243177
388	20.100567	10.194.3.62	10.194.3.61	126		HTTP/1.1 200 Connection established
389	20.101943	10.194.3.61	10.194.3.62	571	www.ti.com	Client Hello
390	20.101978	10.194.3.62	10.194.3.61	54		8080 → 63176 [ACK] Seq=73 Ack=733 Win=31744 Len=0
391	20.102111	10.47.3.62	23.74.131.118	213	www.ti.com	Client Hello
392	20.102476	23.74.131.…	10.47.3.62	66		443 → 15006 [ACK] Seq=1 Ack=148 Win=43776 Len=0 TSval=4141243177 TSecr=303843
400	20.300292	23.74.131.…	10.47.3.62	1598		Server Hello
401	20.300353	10.47.3.62	23.74.131.118	66		[TCP ACKed unseen segment] 15006 → 443 [ACK] Seq=148 Ack=2881 Win=35840 Len=0 TSval=303862 TSecr=41
402	20.300376	23.74.131.…	10.47.3.62	985		[TCP Previous segment not captured] 443 → 15006 [PSH, ACK] Seq=2881 Ack=148 Win=65024 Len=919 TSval
403	20.300385	10.47.3.62	23.74.131.118	66		[TCP ACKed unseen segment] 15006 → 443 [ACK] Seq=148 Ack=3800 Win=37888 Len=0 TSval=303862 TSecr=41
404	20.306344	10.194.3.62	10.194.3.61	1598		8080 → 63176 [PSH, ACK] Seq=73 Ack=733 Win=31744 Len=1544 [TCP segment of a reassembled PDU]
405	20.306377	10.47.3.62	23.74.131.118	192		Client Key Exchange, Change Cipher Spec, Encrypted Handshake Message
406	20.307196	10.194.3.61	10.194.3.62	54		[TCP ACKed unseen segment] 63176 → 8080 [ACK] Seq=733 Ack=3519 Win=2102272 Len=0
407	20.326252	10.194.3.61	10.194.3.62	180		[TCP ACKed unseen segment] , Client Key Exchange, Change Cipher Spec, Encrypted Handshake Message

Transparent Proxy Inline Proxy Deployment

- FortiProxy appliance acts as a transparent bridge in the network and analyze client content traversing the device



Transparent Inline Deployment: Web Traffic

```
# diagnose wad filter src 10.194.3.61
# diagnose wad session list
Session: transparent proxy 10.194.3.61:63260(10.47.3.63:18166)->104.69.82.240:443
id=1189799778 worker=0 vd=0 fw-policy=2
```

Log & Report

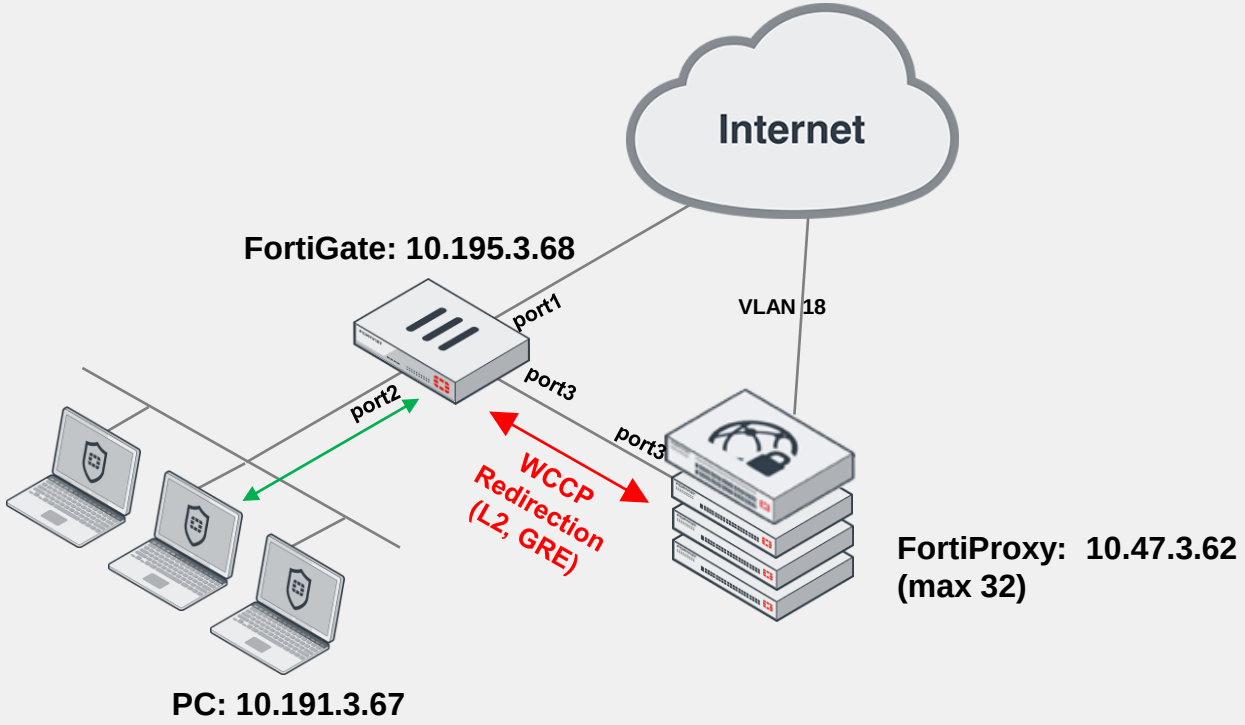
Forward Traffic

#	Date/Time	Source	Destination	Service	Result	Policy
1	11:52:13	10.194.3.61	104.69.82.240	HTTPS	89.01 kB / 11.70 kB	2 (Intercept-Web-Service)

	Time	Source	Destination	Frame len	Server Name	Info
100	9.946397	10.194.3.61	192.168.148.6	70		Standard query 0x89ce A www.ti.com
101	9.946479	10.47.3.63	192.168.148.6	70		Standard query 0x89ce A www.ti.com
102	9.964461	192.168.148.6	10.47.3.63	434		Standard query response 0x89ce A www.ti.com CNAME china.www.ti.com.edgekey.net CNAME china.www.ti.com.edgeke
103	9.964510	192.168.148.6	10.194.3.61	434		Standard query response 0x89ce A www.ti.com CNAME china.www.ti.com.edgekey.net CNAME china.www.ti.com.edgeke
104	9.969130	10.194.3.61	104.69.82.240	66		63260 → 443 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM=1
105	9.969221	104.69.82.240	10.194.3.61	66		443 → 63260 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1460 SACK_PERM=1 WS=128
108	9.969605	10.194.3.61	104.69.82.240	54		63260 → 443 [ACK] Seq=1 Ack=1 Win=2102272 Len=0
110	9.969901	10.47.3.63	104.69.82.240	74		18166 → 443 [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SACK_PERM=1 TSval=426393 TSecr=0 WS=1024
116	9.970927	10.194.3.61	104.69.82.240	571	www.ti.com	Client Hello
117	9.970943	104.69.82.240	10.194.3.61	54		443 → 63260 [ACK] Seq=1 Ack=518 Win=30336 Len=0
138	10.145629	104.69.82.240	10.47.3.63	74		443 → 18166 [SYN, ACK] Seq=0 Ack=1 Win=65160 Len=0 MSS=1460 SACK_PERM=1 TSval=390449804 TSecr=426393 WS=128
139	10.145673	10.47.3.63	104.69.82.240	66		18166 → 443 [ACK] Seq=1 Ack=1 Win=29696 Len=0 TSval=426411 TSecr=390449804
145	10.233453	10.47.3.63	104.69.82.240	213	www.ti.com	Client Hello
146	10.233681	104.69.82.240	10.47.3.63	66		443 → 18166 [ACK] Seq=1 Ack=148 Win=43776 Len=0 TSval=390449804 TSecr=426420
162	10.838250	104.69.82.240	10.47.3.63	1598		Server Hello
163	10.838274	10.47.3.63	104.69.82.240	66		[TCP ACKed unseen segment] 18166 → 443 [ACK] Seq=148 Ack=2881 Win=35840 Len=0 TSval=426480 TSecr=390450496
164	10.838287	104.69.82.240	10.47.3.63	985		[TCP Previous segment not captured] 443 → 18166 [PSH, ACK] Seq=2881 Ack=148 Win=65024 Len=919 TSval=3904504
165	10.838292	10.47.3.63	104.69.82.240	66		[TCP ACKed unseen segment] 18166 → 443 [ACK] Seq=148 Ack=3800 Win=37888 Len=0 TSval=426480 TSecr=390450496
166	10.839628	104.69.82.240	10.194.3.61	1598		443 → 63260 [PSH, ACK] Seq=1 Ack=518 Win=30336 Len=1544 [TCP segment of a reassembled PDU]
167	10.839653	10.47.3.63	104.69.82.240	192		Client Key Exchange, Change Cipher Spec, Encrypted Handshake Message
168	10.840183	10.194.3.61	104.69.82.240	54		[TCP ACKed unseen segment] 63260 → 443 [ACK] Seq=518 Ack=3447 Win=2102272 Len=0
173	10.845442	10.194.3.61	104.69.82.240	180		[TCP ACKed unseen segment] , Client Key Exchange, Change Cipher Spec, Encrypted Handshake Message
174	10.845458	104.69.82.240	10.194.3.61	54		[TCP Previous segment not captured] 443 → 63260 [ACK] Seq=3447 Ack=644 Win=30336 Len=0

Transparent Proxy WCCP Deployment

- FortiProxy appliance acts as a transparent bridge in the network and analyze client content traversing the device.
- WCCP can be used to integrate with an existing network architecture and deliver scalability and load balancing. Supports WCCP client and Mask assignment.



WCCP Load distribution supports distribution across multiple devices, with "HERE I AM" and "I SEE YOU" discovery

Transparent Proxy WCCP Deployment: Setting on FortiGate

```
config system settings
   set wccp-cache-engine  disable  >>FGT act as
wccp router
end
config system interface
    edit "port3"  >>To FortiProxy
        set ip 10.195.3.68 255.255.252.0
        set wccp enable
end
config system wccp
     edit "97"  >> Service group id
        set router-id 10.195.3.68
        set server-list 10.195.0.0 255.255.252.0
        set server-type proxy
        set forward-method L2
        set return-method L2
next
```

```
config firewall policy
    edit 1
        set srcintf "port2"
        set dstintf "port1"
....
        set wccp enable >>Redirect
to WCCP Cache (FortiProxy)
    next
end
```

Tips for WCCP Service group:

- use same group id on both side
- Service Group 0 is for only http
- Service Group 5 is for only ftp
- Service Group 70 is for only https
- Available Service Group ID that support dynamic port intercept are 51-255

Transparent Proxy WCCP Deployment: Setting on FortiProxy

```
config system settings
   set wccp-cache-engine  enable  >>FPX act as wccp Cache
end
config system interface
    edit "port3"  >>To FortiGate
        set ip 10.195.3.62 255.255.252.0
        set wccp enable
end
config system wccp
     edit "97"
        set cache-id 10.195.3.62
        set router-list "10.195.3.68"
        set ports-defined destination
        set ports 80 443
        set cache-engine-method L2
next
```

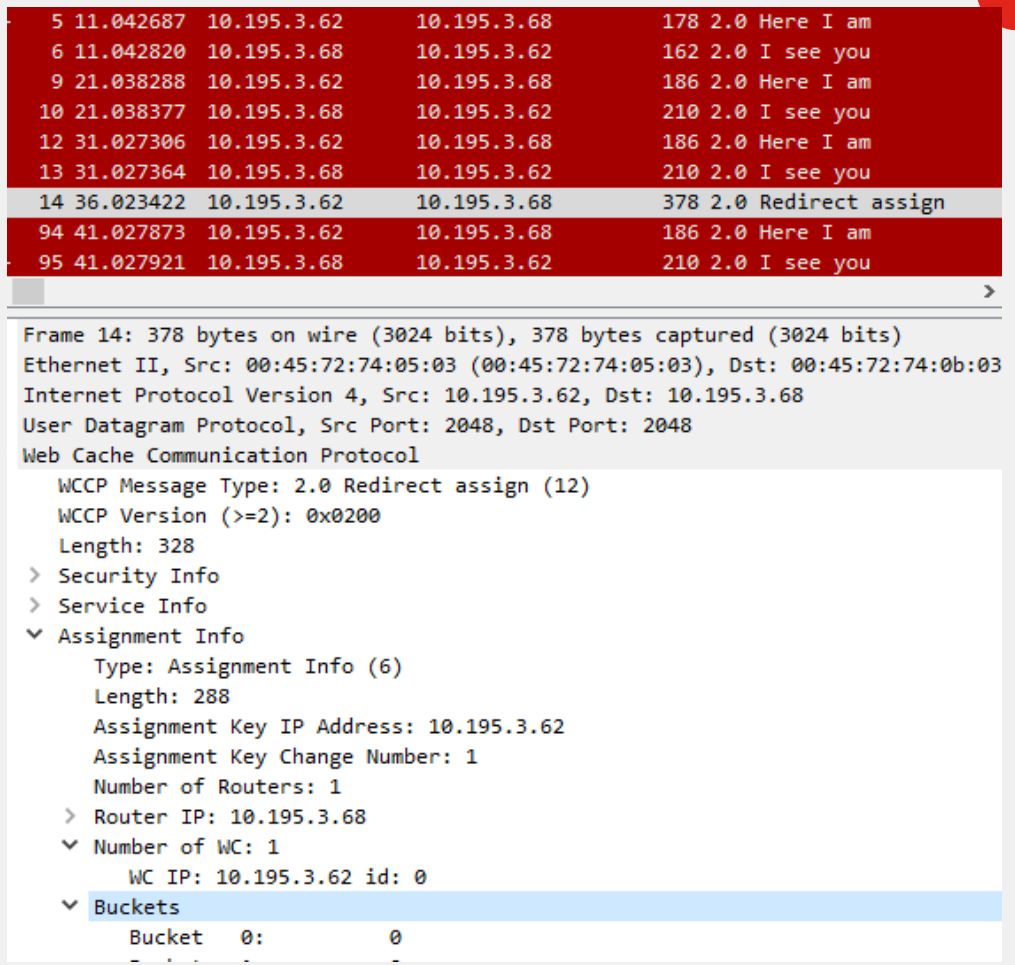
```
config firewall policy
    edit 4
        set srcintf "port3"
        set dstintf "port1"
        set srcaddr "all"
        set dstaddr "all"
        set action accept
        set schedule "always"
        set service "HTTP" "HTTPS"
       set webproxy-profile "Default"
Next
```

Note: Default Proxy policy type is 'Transparent'

Verify wccp status

FGT # diagnose test application wccp 5

```
service-97 in vdom-root: installed
key: ip=10.195.3.62, change-number=1
cache_list: 1
        0. 10.195.3.62
primary assignment:
key=10.195.3.62 change-number=1
num_routers=1
router element[0]: router_id=10.195.3.68,
receive_id=4, ch_no=1
cache-server-num=1, format=not standard:
  10.195.3.62
buckets:
  00  00  00  00  00  00  00  00  00  00  00
00  00  00  00  00  00  00  00  00  00  00
00 ….
```



FPX # diagnose test application wccp 6

```
service-97 in vdom-root
erouter_list: 1 routers in total
        0. 10.195.3.68
        receive_id:24 change_number:2
        cache servers seen by this router:
                0. 10.195.3.62 weight:0 (*Designated
Web Cache)
```

Verify L2 Redirect Traffic-FGT

FGT Debug flow:

```
id=20085 trace_id=10 func=print_pkt_detail line=5727 msg="vd-root:0 received a
packet(proto=6, 10.191.3.67:58427->34.104.35.123:80) from port2. flag [S], seq
2481449498, ack 0, win 64240"

id=20085 trace_id=10 func=init_ip_session_common line=5898 msg="allocate a new
session-000021eb"

id=20085 trace_id=10 func=iprope_dnat_check line=5038 msg="in-[port2], out-[]"

id=20085 trace_id=10 func=iprope_dnat_check line=5051 msg="result: skb_flags-
02000000, vid-0, ret-no-match, act-accept, flag-00000000"

id=20085 trace_id=10 func=vf_ip_route_input_common line=2621 msg="find a route:
flag=04000000 gw-10.47.7.254 via port1"

id=20085 trace_id=10 func=iprope_fwd_check line=764 msg="in-[port2], out-
[port1], skb_flags-02000000, vid-0, app_id: 0, url_cat_id: 0"

....

id=20085 trace_id=10 func=fw_forward_handler line=799 msg="Allowed by Policy-1:"

id=20085 trace_id=10 func=wccp_output line=297 msg="l2_forward"

id=20085 trace_id=10 func=wccp_output line=312 msg="send packet via dev-port3"
```

Verify L2 Redirect Traffic-FPX

```
FPX# diagnose  hardware deviceinfo  nic port3
Name:              port3
...
Hwaddr:            00:45:72:74:05:03 <<
```

Log & Report	#		Date/Time	Source	Destination	Service	Result	Policy
Forward Traffic	1		11:45:12	10.191.3.67	103.51.64.224	HTTPS	2.42 kB / 1.46 MB	4 (WCCP)

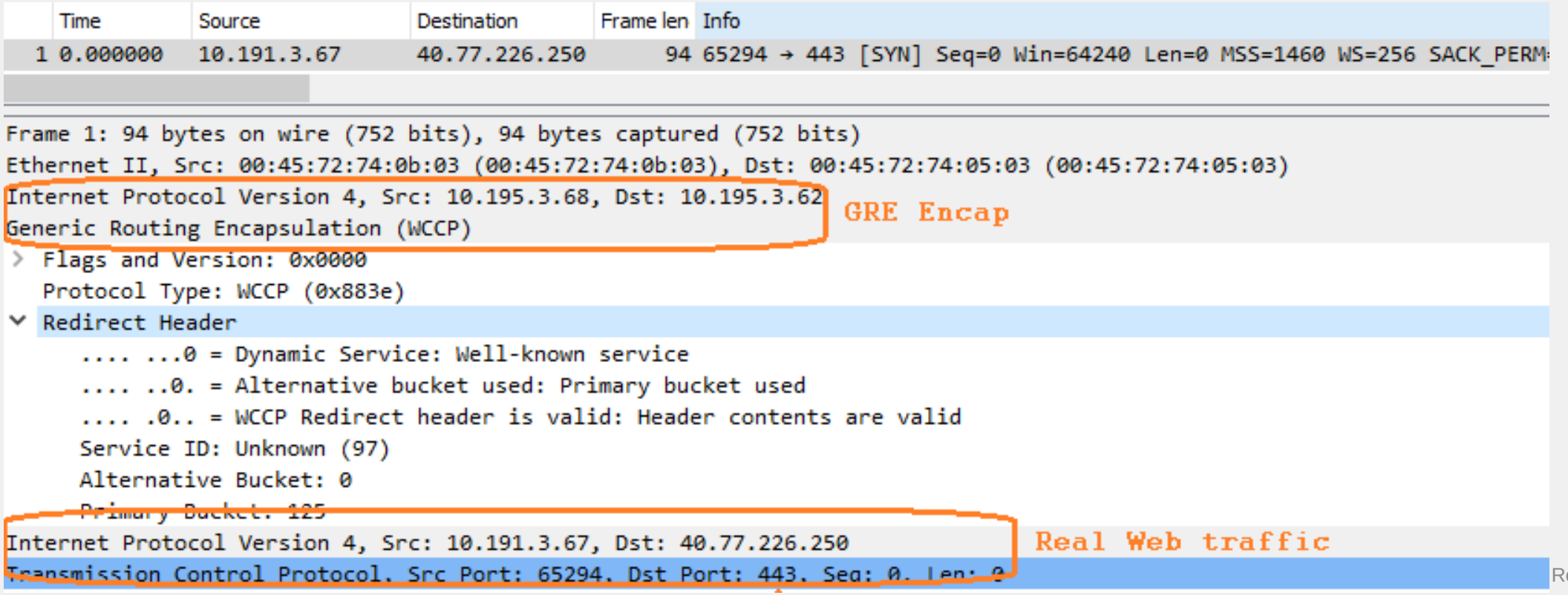
	Time	Source	Destination	Frame len	Server Name	Info
11	0.644148	10.191.3.67	103.51.64.224	66		65281 → 443 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256
12	0.644230	103.51.64.224	10.191.3.67	66		443 → 65281 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=
13	0.644974	10.191.3.67	103.51.64.224	54		65281 → 443 [ACK] Seq=1 Ack=1 Win=2102272 Len=0
14	0.645322	10.191.3.67	103.51.64.224	576	www.rd.go.th	Client Hello
15	0.645342	103.51.64.224	10.191.3.67	54		443 → 65281 [ACK] Seq=1 Ack=523 Win=30336 Len=0
16	0.723272	103.51.64.224	10.191.3.67	191		Server Hello, Change Cipher Spec, Encrypted Handshake M
17	0.724535	10.191.3.67	103.51.64.224	105		Change Cipher Spec, Encrypted Handshake Message
18	0.724566	103.51.64.224	10.191.3.67	54		443 → 65281 [ACK] Seq=138 Ack=574 Win=30336 Len=0

```
Frame 11: 66 bytes on wire (528 bits), 66 bytes captured (528 bits)
Ethernet II, Src: 00:45:72:74:0b:03 (00:45:72:74:0b:03), Dst: 00:45:72:74:05:03 (00:45:72:74:05:03)
  Destination: 00:45:72:74:05:03 (00:45:72:74:05:03)
      Address: 00:45:72:74:05:03 (00:45:72:74:05:03)
      .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
      .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  Source: 00:45:72:74:0b:03 (00:45:72:74:0b:03)
    Type: IPv4 (0x0800)
Internet Protocol Version 4, Src: 10.191.3.67, Dst: 103.51.64.224
Transmission Control Protocol, Src Port: 65281, Dst Port: 443, Seq: 0, Len: 0
```

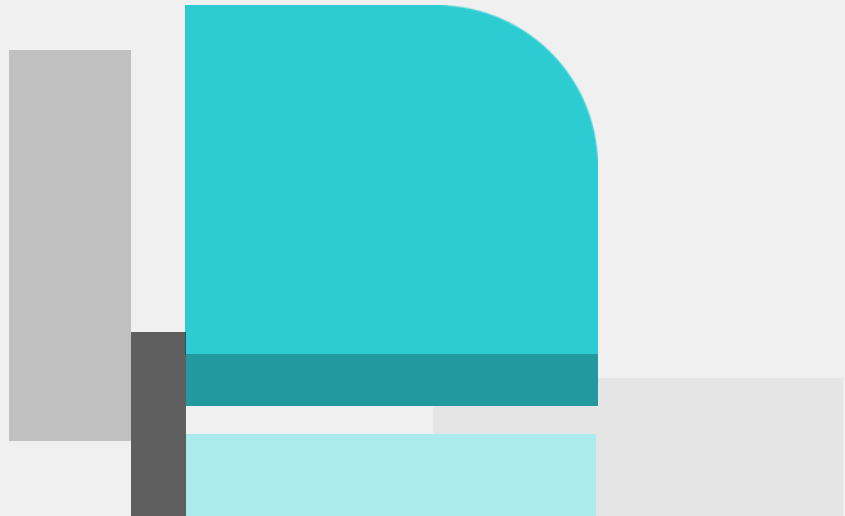
Verify GRE Redirect Traffic

FGT Debug flow:

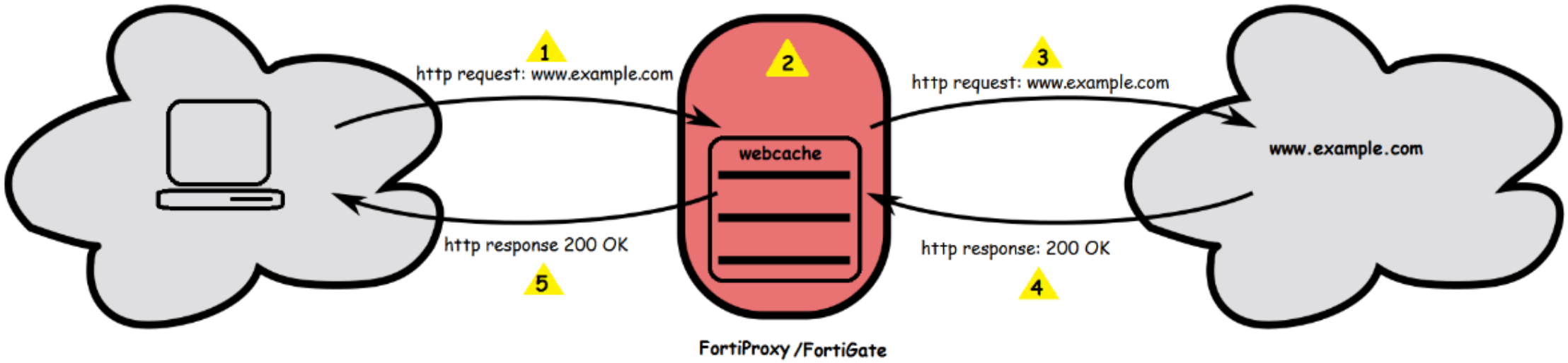
```
id=20085 trace_id=2 func=print_pkt_detail line=5727 msg="vd-root:0 received a
packet(proto=6, 10.191.3.67:65294->40.77.226.250:443) from port2. flag [S], seq
3254445230, ack 0, win 64240"

.....

id=20085 trace_id=2 func=fw_forward_handler line=799 msg="Allowed by Policy-1:"
id=20085 trace_id=2 func=wccp_output line=245 msg="gre_forward"
id=20085 trace_id=2 func=wccp_output line=291 msg="send packet via dev-port3"
```



Understanding Web Proxy flow



Web Proxy Flow



Webproxy Traffic flow

Use the following debugging command to display the HTTP flow for Explicit Proxy Service:

diagnose wad debug enable category http

diagnose wad debug enable category policy

diagnose wad debug enable level info

diagnose wad debug show

Category: http policy

Level: info

NOTE: category ALL **not recommend** as it might cause High CPU on wad

1. Receive an HTTP request from the client:

```
[0x7ff98710b050] Received request from client: 192.168.244.4:2052
GET  http://www.example.com/ HTTP/1.1
Accept: text/html, application/xhtml+xml, */*
Accept-Language: en-US
User-Agent: Mozilla/5.0 (Windows NT 6.1; WOW64; Trident/7.0; rv:11.0) like Gecko
Accept-Encoding: gzip, deflate
Host: www.example.com
```

2. FortiProxysends a DNS request for www.example.com / or check Cache content/ check Web filter category/action

```
[0x7ff98710b050] DNS request name=www.example.com len=10 type/pref=0/0
```

3. FortiProxy sends an HTTP request to the www.example.com server:

```
[0x7ff98710b050] Connect to server: 184.29.23.193:80
[0x7ff98710b050] Forward request to server:
GET / HTTP/1.1
Accept: text/html, application/xhtml+xml, */*
Accept-Language: en-US
User-Agent: Mozilla/5.0 (Windows NT 6.1; WOW64; Trident/7.0; rv:11.0) like Gecko
Accept-Encoding: gzip, deflate
Host: www.example.com
DNT: 1
Connection: Keep-Alive
```

4. FortiProxy receives an HTTP response from the server:

```
[0x7ff98710b050] Received response from server:

HTTP/1.1 200 OK

Server: Apache

Last-Modified: Thu, 07 Mar 2019 16:52:00 GMT

ETag: "e0e1-58383ecc76c00"

Accept-Ranges: bytes

Content-Encoding: gzip

X-Frame-Options: SAMEORIGIN

Content-Type: text/html; charset=UTF-8

X-Akamai-Transformed: 9 - 0 pmb=mTOE,2

Date: Thu, 28 Mar 2019 02:06:48 GMT

Content-Length: 10427

Connection: keep-alive
```

5. FortiProxy forwards the HTTP response to the client:

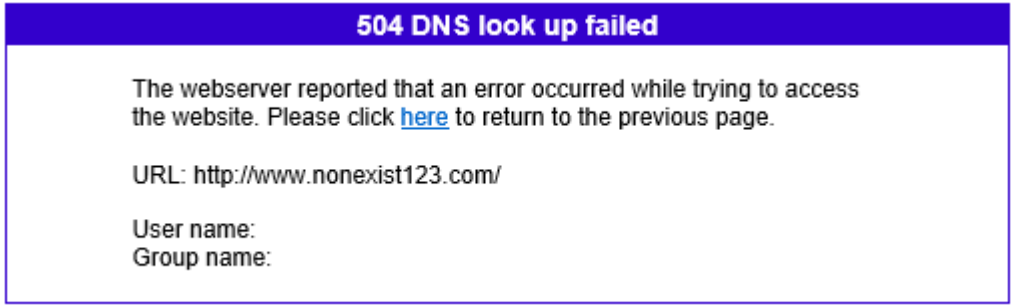
```
[0x7ff98710b050] Forward response from server:

HTTP/1.1 200 OK

Server: Apache

Last-Modified: Thu, 07 Mar 2019 16:52:00 GMT

ETag: "e0e1-58383ecc76c00"

Accept-Ranges: bytes

Content-Encoding: gzip

X-Frame-Options: SAMEORIGIN

Content-Type: text/html; charset=UTF-8

X-Akamai-Transformed: 9 - 0 pmb=mTOE,2

Date: Thu, 28 Mar 2019 02:06:48 GMT

Content-Length: 10427
```

Webproxy Traffic flow

Sample wad debug #1 : *504 Gateway Timeout (DNS)*

[0x7fae0f12a1d0] Received request from client: 192.168.244.4:51481

GET http://www.nonexist123.com/ HTTP/1.1
Host: www.nonexist123.com
….



[0x7fae0f12a1d0] DNS request name=www.nonexist123.com len=19 type/pref=0/0
wad_http_client_read_sync(27334): state=3 clt->pause=1 ret=1

[0x7fae0f12a1d0] DNS resolved: N/A
__wad_http_build_replmsg_resp(18135): Generating replacement message. DNS error

[0x7fae0f12a1d0] Forward response from cache:

HTTP/1.1 504 Gateway Timeout
Content-Type: text/html
Cache-Control: no-cache

Steps to troubleshoot

- Ping from FortiProxy to url:

```
#execute ping www.nonexist123.com
Unable to resolve hostname.
```

- Check reachability to DNS server:

```
 # execute ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8): 56 data bytes
64 bytes from 8.8.8.8: icmp_seq=0 ttl=116 time=7.0 ms
64 bytes from 8.8.8.8: icmp_seq=1 ttl=116 time=7.2 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=116 time=7.2 ms

--- 8.8.8.8 ping statistics ---
3 packets transmitted, 3 packets received, 0% packet loss
round-trip min/avg/max = 7.0/7.2/7.4 ms
```

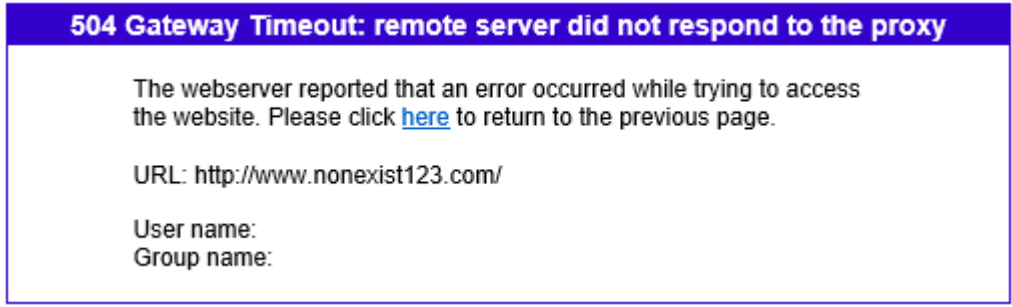
- Run packet capture for dns traffic while try to ping to url again:

```
# diagnose  sniffer packet  any 'host 8.8.8.8 and port 53' 6 0 l
interfaces=[any]
filters=[host 8.8.8.8 and port 53]
2021-11-08 20:43:03.145012 port1 out 10.47.2.122.1120 -> 8.8.8.8.53: udp
37
```

No.	Time	Source	Destination	Frame len	Info
1	0.000000	10.47.2.122	8.8.8.8	79	Standard query 0x80b6 A www.nonexist123.com
2	0.014670	8.8.8.8	10.47.2.122	152	Standard query response 0x80b6 No such name A www.nonexist123.com SOA a.gtld-servers.net

Webproxy Traffic flow

Sample wad debug #2 : *504 Gateway Timeout (No response from the server)*



[0x7f5cf37f13d0] Received request from client: 192.168.244.139:49331

GET http://www.nonexist123.com/ HTTP/1.1
[0x7f5cf37f13d0] DNS request name=www.nonexist123.com len=19 type/pref=0/0
wad_http_client_read_sync(27334): state=3 clt->pause=1 ret=1
[0x7f5cf37f13d0] DNS resolved: 1.2.3.4
wad_http_request_policy_set(24453): match pid=260 policy-id=559 vd=0 in_if=10, out_if=10 192.168.244.139:49331 ->1.2.3.4:80
[0x7f5cf37f13d0] Connect to server: 1.2.3.4:80
wad_http_forward_request_start(15294): http session 0x7f5cf3894ed0 req=0x7f5cf37f13d0 connecting
.....
__wad_http_trap_port_close(12275): trap port event close
__wad_http_build_replmsg_resp(18135): Generating replacement message. 504 error
wad_http_client_notify(19118): @@@ http client 0x7f5cf3894ed8 resume_read=0
wad_http_send_cache_resp(16708): req=0x7f5cf37f13d0 body_expect=0
[0x7f5cf37f13d0] Forward response from cache:
HTTP/1.1 504 Gateway Timeout
Content-Type: text/html

Steps to troubleshoot

- Run packet capture for traffic between FortiProxy and server while try to access url from client:

```
# diagnose  sniffer packet  any 'host <FortiProxy wan ip> or host
<Server IP>' 6 0 1
interfaces=[any]
filters=[<FortiProxy wan ip> or <Server IP>]
```

- Tips: How to know server ip:

```
# diagnose  test application  dnsproxy 7
vfid=0, name=www.ti.com, ttl=20:18:1798
        23.199.87.15 (ttl=20)  <<<<<
```

- If there's multiple ip, please collect packet capture with all ip and keep running below command during test to match client/server tcp port:

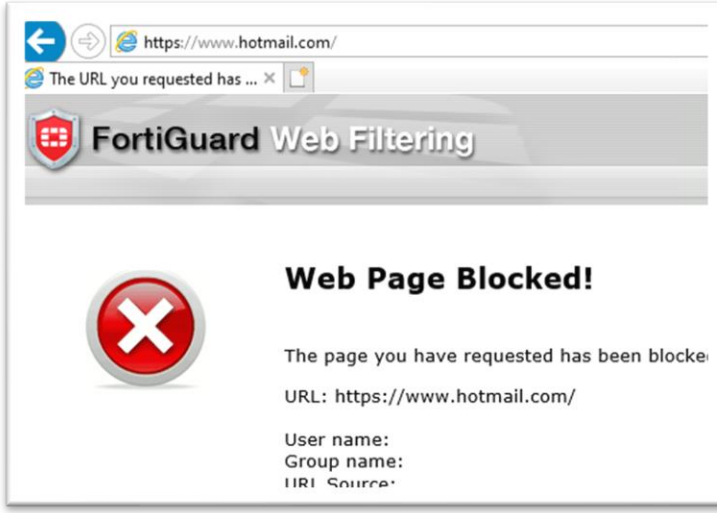
```
# diagnose  wad session list
Session: explicit proxy 10.96.1.128:56509(10.91.167.148:59820)->
23.199.87.15:443
```

Web server ip: Port

Client ip:port

FortiProxy ip:Port

Sample wad debug #3 : *Block by Web Filter*



[0x7f5cf37f0a10] Received request from client: 192.168.244.139:49331
GET http://www.hotmail.com/ HTTP/1.1
[0x7f5cf37f0a10] DNS request name=www.hotmail.com len=15 type/pref=0/0
wad_http_client_read_sync(27334): state=3 clt->pause=1 ret=1
[0x7f5cf37f0a10] DNS resolved: 204.79.197.212
wad_http_request_policy_set(24453): match pid=260 policy-id=559 vd=0 in_if=10, out_if=10 192.168.244.139:49331->204.79.197.212:443
wad_url_filter_req_alloc(822): url_req=0x7f5cf3946f30 id=52
wad_http_client_read_sync(27334): state=3 clt->pause=1 ret=1
wad_url_cat_find(1479): url right-away category not hit: is_ip=0 url/ip=0/0
wad_url_filter_check_url_filter_on_result(2602): get result id=52 cate=23 action=ftgd-block warn_domain=0 warn_session=0
__wad_http_build_replmsg_resp(18135): Generating replacement message. FTGD blocked

[0x7f5cf37f0a10] Forward response from cache:

HTTP/1.1 403 Forbidden

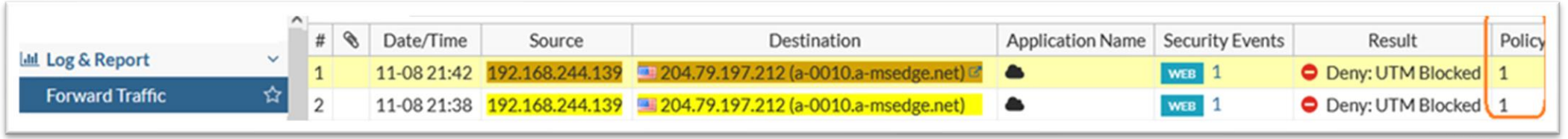
Step to troubleshoot

Check setting on Matching policy, from wad debug, from traffic log and from Policy test.

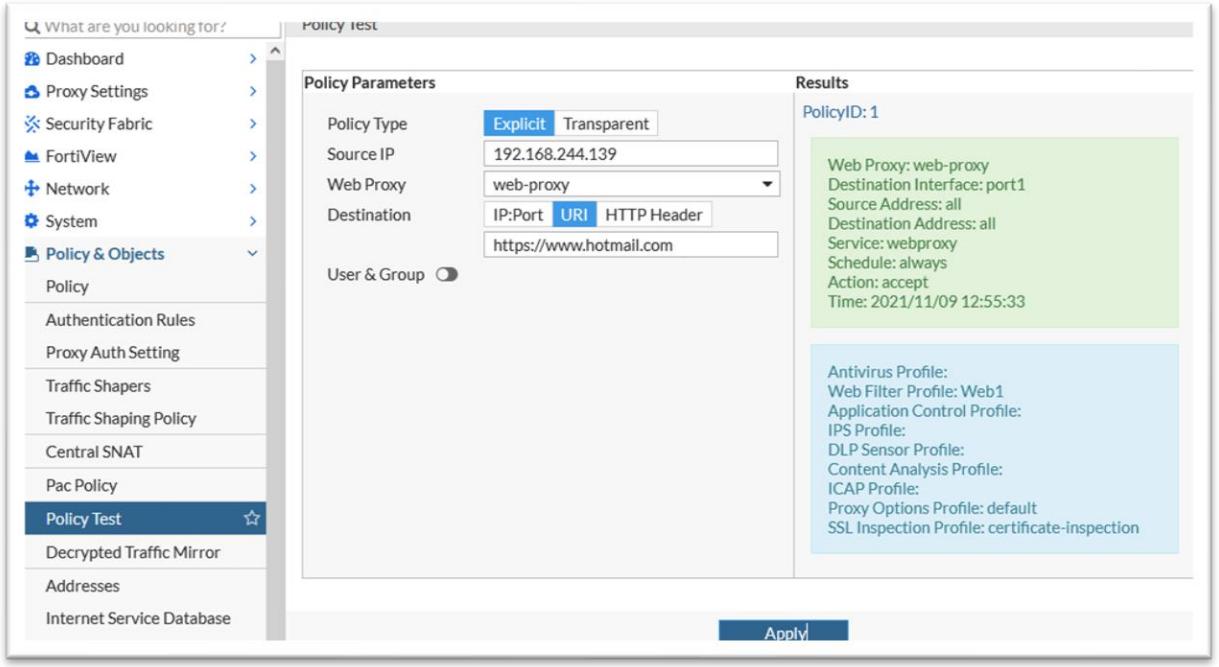
- Wad debug:

```
wad_http_request_policy_set(24453): match pid=260 policy-id=559 vd=0 in_if=10,
out_if=10 192.168.244.139:49331->204.79.197.212:443
```

- Traffic log:

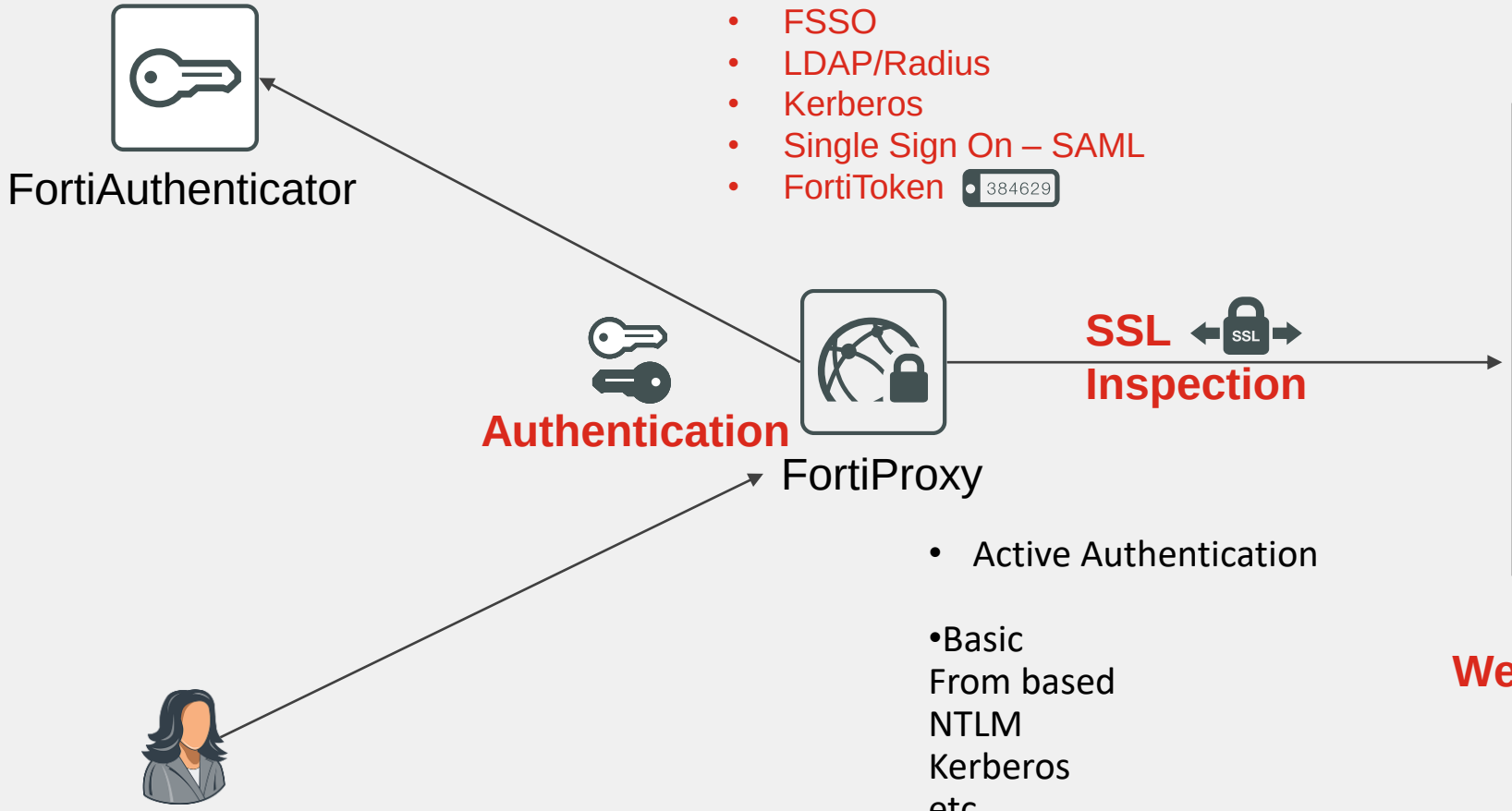


- Policy Test:



Authentication and Authorization

Acceptable Use Policy Enforcement



Web Filtering

- Integration with threat intelligence
- Upload external blacklists
- Web Application Control
- Static web filtering
- Warning Page to user

Authentication

Authentication Types:

Active Authentication

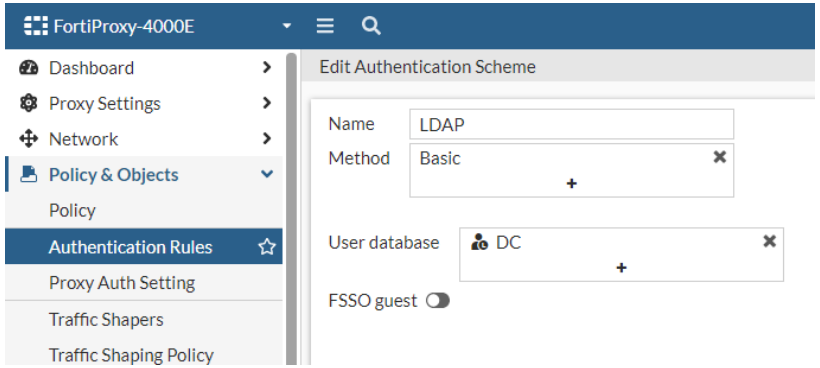
Basic
From based
NTLM
Kerberos
etc..

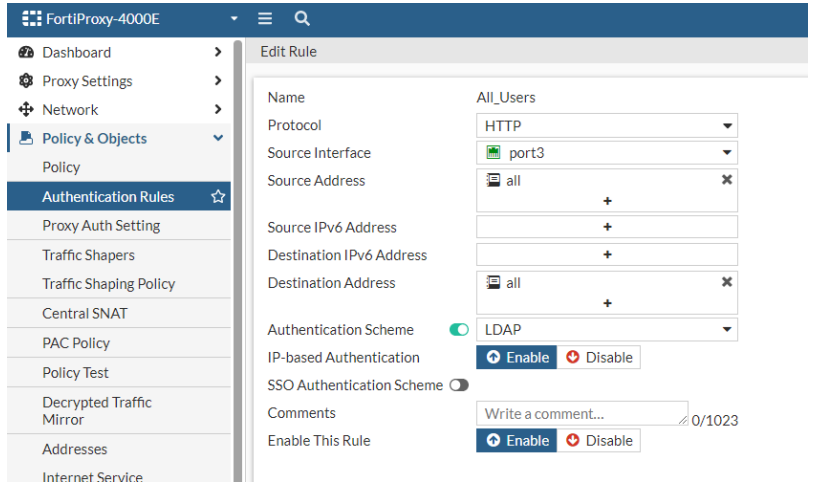
Passive Authentication

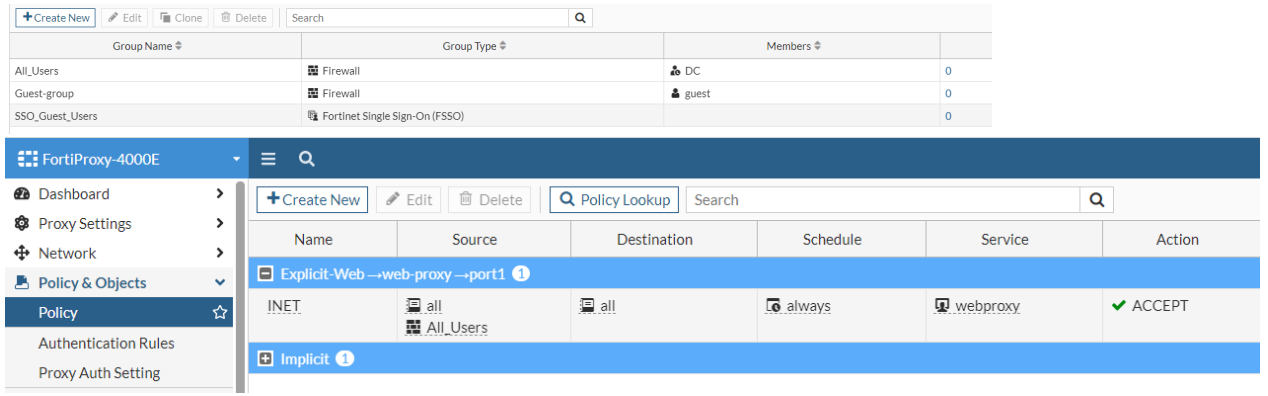
FSSO
RSSO

Configuration Includes

Authentication Scheme (User Database Source)
Authentication rules.
Users/Groups.
Firewall policies.







Troubleshooting Authentication issues.

List / Clear Authenticated users.

```
# diagnose wad user list
# diagnose firewall auth list
# diagnose wad user clear << clear authenticated users.
```

```
FortiProxy-4000E # diag wad user list

ID: 4, VDOM: root, IPv4: 10.203.7.4
  user name    : fortinet
  worker       : 48
  duration     : 9
  auth_type    : IP
  auth_method  : Basic
  pol_id       : 0
  g_id         : 0
  user_based   : 0
  expire       : no
  LAN:
    bytes_in=94809 bytes_out=1552168
  WAN:
    bytes_in=2972954 bytes_out=151008
```

List User group membership for IP based / FSSO users.

```
# diagnose test application wad 2400 << switch to informer daemon
# diagnose test application wad 110
```

List FSSO User database synchronized from the Collector agent

```
# dignose debug authd fsso list
```

Troubleshooting Authentication issues.

Debug commands to troubleshoot Authentication issues.

Webproxy Authentication debug.

```
# diag wad deb enable category auth
# diag deb en
```

Radius / LDAP (authentication

```
# diag deb app fnbamd -1   ** (LDAP authentication only when “ldap-user-cache” is disabled)
# diag deb en
```

Packet sniffer.

```
# diag sniffer packet any ‘host User_IP’ 6 0 l

# diag sniffer packet any ‘host Authentication_Server’ 6 0 l
```

Troubleshooting Authentication issues.

When using Session based Authentication:

```
config authentication rule
    edit "All_Users“
        set ip-based disable
        set web-auth-cookie enable
    next
end
```

Note : web-auth Cookie is available only with session-based authentication. i.e., IP based authentication disabled.

This setting reduces authentication requests for existing sessions, which makes NTLM authentication more scalable.

Troubleshooting Authentication issues.

LDAP User Cache – Long time cache

```
config web-proxy global
    set ldap-user-cache enable >> enable by default
end
```

When the LDAP user cache is enabled FortiProxy uses Long time Cache, the group cache is kept 15 days for inactivity and uses background refreshing to fetch server-side changes

Clearing the Cache

```
diagnose test application wad 2500 << switch to user-information daemon
diagnose test application wad 160 << clear cached user info mapping table
diagnose test application wad 157 << clear cached SID mapping table
```

Performance issues

Performance issue on FortiProxy

```
# diag sys top-mem
```

List top processes by memory usage

```
ipshelper (3747): 177732kB
node (3724): 159605kB
miglogd (3816): 151949kB
miglogd (3824): 151210kB
miglogd (3745): 150447kB
```

```
# diag sys top 1 99

Run Time:  0 days, 22 hours and 40 minutes
16U, 0N, 4S, 63I, 8WA, 0HI, 9SI, 0ST; 32110T, 6701F
             wad     1471      S      24.7     1.3     4
             wad     1472      R      23.7     1.3     8
             wad    11873      S      19.8     1.1     2
             wad     1474      S      18.8     1.4     5
             wad     1475      R      18.8     1.3     2
     wad_csvc_cs     1452      S       4.4     0.9    15
       ipsengine     1650      S <     3.9     0.7     8
```

Name of the process

CPU usage

Memory usage

wad: responsible for Webproxy / Proxy inspection / web cache & Wan optimization services

wad_csvc_cs: the central Caching daemon that maintains the in-memory cached objects. And consuming around 20% of memory is consider normal

Performance issue on FortiProxy

```
# get sys perf status
CPU states: 14% user 3% system 0% nice 65% idle 9% iowait 0% irq 9% softirq
CPU0 states: 15% user 4% system 0% nice 77% idle 0% iowait 0% irq 4% softirq
CPU1 states: 5% user 1% system 0% nice 81% idle 0% iowait 0% irq 13% softirq
CPU2 states: 6% user 1% system 0% nice 89% idle 0% iowait 0% irq 4% softirq
CPU3 states: 21% user 4% system 0% nice 60% idle 0% iowait 0% irq 15% softirq
CPU4 states: 9% user 2% system 0% nice 86% idle 0% iowait 0% irq 3% softirq
CPU5 states: 12% user 2% system 0% nice 80% idle 0% iowait 0% irq 6% softirq
CPU6 states: 20% user 3% system 0% nice 70% idle 0% iowait 0% irq 7% softirq
Memory: 32880948k total, 13923920k used (42.3%), 6955908k free (21.2%), 12001120k freeable (36.5%)
Average network usage: 38432 / 55769 kbps in 1 minute, 46470 / 62205 kbps in 10 minutes, 47504 / 65250 kbps
in 30 minutes
Maximal network usage: 67436 / 77805 kbps in 1 minute, 124226 / 112866 kbps in 10 minutes, 124226 / 126075
kbps in 30 minutes
Average sessions: 52974 sessions in 1 minute, 52837 sessions in 10 minutes, 50262 sessions in 30 minutes
Maximal sessions: 55892 sessions in 1 minute, 59093 sessions in 10 minutes, 59093 sessions in 30 minutes
Average session setup rate: 1204 sessions per second in last 1 minute, 1236 sessions per second in last 10
minutes, 1271 sessions per second in last 30 minutes
Maximal session setup rate: 1400 sessions per second in last 1 minute, 1940 sessions per second in last 10
minutes, 1940 sessions per second in last 30 minutes
Virus caught: 0 total in 1 minute
IPS attacks blocked: 0 total in 1 minute
Uptime: 0 days,  23 hours,  40 minutes
```

Overall CPU usage

CPU usage per core

Tips:

- Freeable memory = reclaimable
- Look for CPU utilization per CPU core.

>>>"*freeable*" :memory which can be released under system pressure.

So, the actual free memory is around 57% in this example >>>>>>

Check load for each wad worker vs CPU/memory usage

```
# diagnose  wad license detail
Purchased License Seat: 2500
Available License Seat: 2500
Max Licensed Session: 62500
Current User Count: 234
Current Licensed Sessions: 444
Max bypassed Sessions: 0
Session counts:
                licensed          bypassed      total licensed
 worker 0:            41                 0              107663
 worker 1:            64                 0              111616
 worker 2:            55                 0              118094
 worker 3:            61                 0              104250
 worker 4:            77                 0              114735
 worker 5:            38                 0              116261
 worker 6:            64                 0              105668
 worker 7:            44                 0               97908
 total:              444                 0              876195
```

```
# diagnose  test application  wad 1000

Process [0]: WAD manager type=manager(0) pid=1778 diagnosis=yes.
Process [1]: type=dispatcher(1) index=0 pid=2434 state=running
             diagnosis=no debug=enable valgrind=unsupported/disabled
Process [2]: type=worker(2) index=0 pid=2436 state=running
             diagnosis=no debug=enable valgrind=supported/disabled
Process [3]: type=worker(2) index=1 pid=2437 state=running
             diagnosis=no debug=enable valgrind=supported/disabled
Process [4]: type=worker(2) index=2 pid=2438 state=running
             diagnosis=no debug=enable valgrind=supported/disabled
Process [5]: type=worker(2) index=3 pid=15110 state=running
             diagnosis=no debug=enable valgrind=supported/disabled
Process [6]: type=worker(2) index=4 pid=2440 state=running
             diagnosis=no debug=enable valgrind=supported/disabled
Process [7]: type=worker(2) index=5 pid=2441 state=running
             diagnosis=no debug=enable valgrind=supported/disabled
Process [8]: type=worker(2) index=6 pid=2442 state=running
             diagnosis=no debug=enable valgrind=supported/disabled
Process [9]: type=worker(2) index=7 pid=2443 state=running
             diagnosis=no debug=enable valgrind=supported/disabled
Process [10]: type=algo(3) index=0 pid=2431 state=running
             diagnosis=no debug=enable valgrind=unsupported/disabled
Process [11]: type=informer(4) index=0 pid=2428 state=running
             diagnosis=no debug=enable valgrind=unsupported/disabled
Process [12]: type=user-info(5) index=0 pid=2433 state=running
             diagnosis=no debug=enable valgrind=supported/disabled
Process [13]: type=debug(8) index=0 pid=2427 state=running
             diagnosis=no debug=enable valgrind=unsupported/disabled
Process [14]: type=config-notify(9) index=0 pid=2430 state=running
             diagnosis=no debug=enable valgrind=unsupported/disabled
```

Additional Diagnosis commands for Performance issues

```
diag debug enable

diag sys top-summary "-s mem -n 20"

diag sys session count

diag sys session list

diag hardware sysinfo memory

diag hardware sysinfo slab

diag wad stats summary

diag wad session list

diag wad license detail

diagnose wad memory stats misc

diagnose wad stats summary

diagnose wad worker tcp stats

diagnose wad worker ssl stats

diagnose wad worker tunnel stats

diagnose wad worker webcache stats

diagnose wad csvc webcache stats

diagnose wad csvc webcache lists

diagnose wacs stats

diagnose wad worker bytecache stats

diagnose wad csvc bytecache stats

diagnose wad csvc bytecache lists

diagnose wadbd stats

diagnose wad worker memcache stats

diagnose wad csvc memcache stats

diagnose debug crashlog read

diag wad memory report
```

Other resources

https://docs.fortinet.com/product/fortiproxy/7.0

https://tools.ietf.org/id/draft-wilson-wrec-wccp-v2-01.txt

https://kb.fortinet.com/kb/documentLink.do?externalID=FD44578

https://kb.fortinet.com/kb/documentLink.do?externalID=FD42352

https://kb.fortinet.com/kb/documentLink.do?externalID=FD42333

https://kb.fortinet.com/kb/documentLink.do?externalID=FD43824

https://kb.fortinet.com/kb/documentLink.do?externalID=FD51936

https://kb.fortinet.com/kb/documentLink.do?externalID=FD46113

FortiProxy and Basic setup: https://www.youtube.com/watch?v=OiYRsJck2u0

FAQ

Q: The clients show pop up "Connecting to proxy server for outlook.office365.com" by authen from Fortiproxy. How I can fix it?
A: If you not intend to authenticate this flow, then you can bypass authentication by use Authentication Rule.

Q: How do we know how many user is currently used user license?
A: From Web access Dashboard>License or from CLI: diagnose wad license summary

Q: Can we do a filter in 'diag wad debug enable all' to a specific source ip/dest ip so that not all logs are displayed ?
A: You can use #diag wad filter src/dst x.x.x.x to filter based on source or destination


FORTINET